Investigation of distortion effect for photonic crystal taper

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Photonic crystal waveguides (PCWGs) is one of the most basic structure that is created from photonic crystal by introducing a linear defect to the lattice. However, for transmission in the communication wavelength, the size of waveguide needs to be is sub-micron or nanometer scale. This poses various problems with coupling as the greatest challenge. Tapers have been integrated to provide modal conversion between light sources and PCWG. Smooth linear taper[1,2] is designed through distortion of the regular lattice structure. The distortion effect is not felt when the taper angle is very small. However, for small taper angle, the taper will need to be reasonably long for good coupling efficiency with fixed input and output width. We investigate the maximum taper angle for photonic crystal taper before the distortion effect becomes significant. Above this taper angle of 23° or taper length shorter than 9.41 μm, the transmission spectrum of the taper is unstable.

[1] P. Pottier, I. Ntakis, and R. M. De La Rue, Optics Communications, **223**, 339 (2003).

[2] E. H. Khoo, J. H. Wu, H. G. Teo, and A. Q. Liu, ICOCN 2004, 215 (2004).

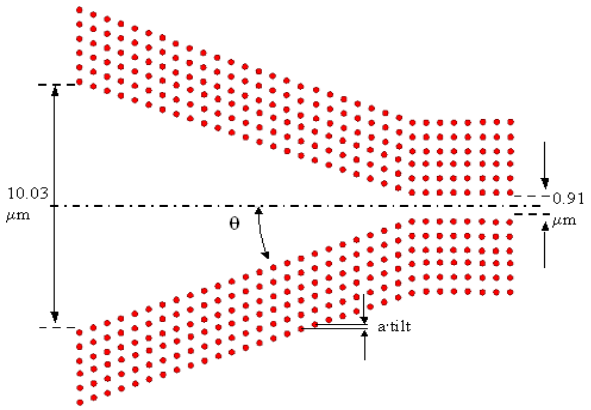

Figure 1: Smooth linear taper by distortion of crystal lattice

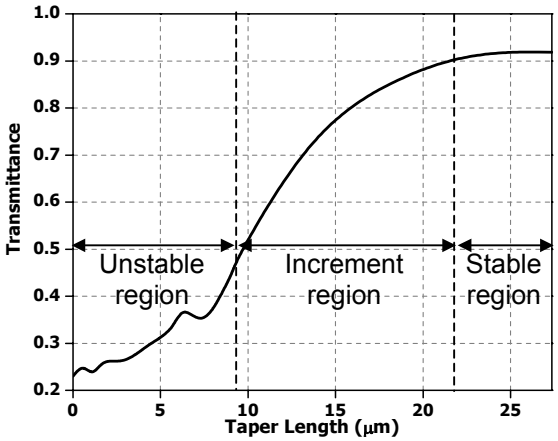

Figure 2: Unstable readings for taper angle greater than 23° or taper length shorter than 9.41 μm